Seat No. : _____

DP-201

December-2025

5 Year Integrated M.Sc. (CS), Sem.-V

(Computer Science)

Data Analytics

Time : 2:00 Hours] **[Max. Marks : 25**

Instructions : (1) Write both the Sections in the separate answer book.
(2) Both Sections having equal weightage.
(3) Draw diagrams wherever necessary.
(4) Make assumptions wherever necessary.

1. (A) Answer the following question :

(a) We have a fictional data set that looks at happiness scores out of 100 and the number of work hours that individual has in a week. **3**

Happiness Score	Work Hour
89	30
90	35
54	40
60	35
73	40
40	70

Calculate Covariance and Correlation Coefficient between happiness score and work hour and state the difference between two.

(b) NRF/BIG research provided results of consumer holiday spending. The data provides the amount of holiday spending for 25 consumers. **3**

1200	850	740	590	340	450	890	260
350	1780	180	850	2050	770	1780	180
2050	770	800	1090	510	520	220	1450
1120	200	350	610	850	280		

Construct frequency distribution table of this and calculate five number summary of this data.

(B) Answer the following questions :

(a) A laboratory blood test is 95 percent effective in detecting a certain disease when it is, in fact, present. However, the test also yields a "false positive" result for 1 percent of the healthy persons tested. (That is, if a healthy person is tested, then, with probability 0.01, the test result will imply that he or she has the disease.) If 0.5 percent of the population actually has the disease, what is the probability that a person has the disease given that the test result is positive ? **2**

(b) For a medical study, a researcher wishes to select people in the middle 60% of the population based on blood pressure. If the mean systolic blood pressure is 120 and the standard deviation is 8, find the upper and lower readings that would qualify people to participate in the study. **2**

OR

1. (A) Answer the following question :

(a) The mean retail price per gallon of gasoline was \$30. Suppose that the standard deviation was \$5. **3**

- What percentage of gasoline is sold between \$20 and \$40 per 3 gallon ?
- In what range approx. 89% of gasoline is sold ?

(b) Sample data comparing the back-to-school expenditures for 25 freshmen and 20 seniors are shown below. Do freshmen or seniors have more variation in back-to-school expenditures ? **2**

	Freshman	**Senior**
$\overline{x}$	1285	433
s	367.04	96.96

(B) Answer the following questions :

(a) A student takes a ten-question true/false exam.

- Find the probability that the student gets exactly six of the ten questions right simply by guessing the answer to every question. **2**
- Find the probability that the student will obtain a passing grade of 60% or greater simply by guessing.

(b) A box contains 8 balls. Three are numbered 3, two are numbered 4, and three are numbered 5. The balls are mixed, and one is selected at random. After a ball is selected, its number is recorded. Then it is replaced. If the experiment is repeated many times, find the mean, variance and standard deviation of the numbers on the balls. **3**

2. (A) Answer the following question :

(a) What are different types of Probabilistic samplings ? Explain each with example. **4**

(b) State the Central Limit theorem. **1**

(B) Answer the following questions :

(a) It has been reported that the average credit card debt for college seniors at the college bookstore for a specific college is \$3262. The student senate at a large university feels that their seniors have a debt much less than this, so it conducts a study of 50 randomly selected seniors and finds that the average debt is \$2995, and the population standard deviation is \$1100. With $\alpha = 0.05$, is the student senate correct ? **2**

(b) The government has proposed labelling tires by fuel efficiency to save fuel and cut emissions. A survey was conducted to see who would use these labels. At $\alpha = 0.10$, is the gender of the individual related to whether a person would use these labels ? The data from a sample are shown here. **3**

Gender	Yes	No	Undecided
Men	114	30	6
Women	136	16	8

OR

2. (A) Answer the following question :

(a) What are different types of non-probabilistic samplings ? Explain each with example. **2**

(b) What is Test of Independence and Goodness of fit and write their hypothesis (null and alternate). **2**

(B) Answer the following questions :

(a) According to the Digest of Educational Statistics, a certain group of preschool children under the age of one year each spends an average of 30.9 hours per week in nonparental care. A study of state university center-based programs indicated that a random sample of 32 infants spent an average of 32.1 hours per week in their care. The standard deviation of the population is 3.6 hours. At $\alpha = 0.01$ is there sufficient evidence to conclude that the sample mean differs from the national mean ? **3**

(b) A researcher read that firearm-related deaths for people aged 1 to 18 were distributed as follows : 74% were accidental, 16% were homicides, and 10% were suicides. In her district, there were 68 accidental deaths, 27 homicides, and 5 suicides during the past year. At $\alpha = 0.10$, test the claim that the percentages are equal. **3**

3. Answer the following questions : **5**

(a) Difference between normal and uniform probability distribution.

(b) What is type I and type II errors ?

(c) Define Critical Region.

(d) Write the possible values of mean and standard deviation for standard normal distribution.

(e) Mode + 2 Mean = _____

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Cryptography

Time : 2:00 Hours] **[Max. Marks : 25**

1. (A) Discuss the difference between stream ciphers and block ciphers with examples. Encrypt "SECURITY IS MANDATORY" using the key "NATION" with Playfair encryption technique. **6**

   (B) Explain the working of the Data Encryption Standard (DES) algorithm with diagram. **4**

OR

1. (A) Explain RSA algorithm with example. **4**

   (B) Explain the concept of public-key cryptography and how it differs from symmetric key systems.
   Encrypt "CRYPTOGRAPHY" using the keyword "KEY" with Vigenere Cipher encryption technique. **6**

2. (A) Describe various password-based authentication mechanisms. What are the different levels of data integrity ? **6**

   (B) Discuss zero-knowledge mechanisms in authentication. **4**

OR

2. (A) Explain fundamentals of key management. Compare security lifetime for keys of 128-bit, 192-bit, and 256-bit strength. **6**

   (B) Explain the working of Message Authentication Codes (MAC). **4**

3. Answer any **five** from the following : **5**

   (1) Cryptography intercepts __ type of data accessibility.
   (A) Authorized (B) Unauthorized (C) Legitimate (D) All of them

   (2) Which of the following stage of cryptography are the readable non-encrypted data ?
   (A) Plaintext (B) Ciphertext (C) Encryption (D) Decryption

   (3) Which of the following are hash functions ?
   (A) MD5 (B) Whirlpool (C) SHA (D) All of them

   (4) Which of the following are the cryptographic algorithms ?
   (A) Triple DES (B) RSA (C) Blowfish (D) All of them

   (5) How many rounds will be there in DES algorithm for decryption ?
   (A) 16 (B) 32 (C) 10 (D) 12

   (6) Which of the following is the bit size of AES ?
   (A) 128 (B) 192 (C) 256 (D) All of them

   (7) Which of the following are the applications of DES algorithm ?
   (A) ATM based encryption (B) E-mail
   (C) Remote access (D) All of them